“DEVELOPMENT AND VALIDATION OF AUGMENTED REALITY PEDAGOGIC APPROACH (ARPA) FOR SCHOOL SCIENCE AT ELEMENTARY LEVEL”

REVIEW OF RELATED LITERATURE TO BE SUBMITTED

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1. INTRODUCTION:

One of the most significant questions of the millennial is which technology is better: AR or VR? Which has better capability to shape our future? The answer to such a question is that both of them have their advantages.

Today, animation has replaced the traditional PowerPoint presentation. A lot of eLearning platforms offer classes where a teacher teaches with the help of live animation and not a static PPT. The concept of interactive learning rather than one-way learning is prevailing.

Schools and colleges are changing their traditional methodologies of teaching. Virtual and Augmented Reality in student Learning and Development will completely revolutionize the way teachers teach and students learn. We have seen a lot of change in the education industry over the years. With the help of AR and VR, students will learn interactively like never before. These new technologies are not limited to any specific age group of students.

1.1 MEANING AND DEFINITIONS OF AUGMENTED REALITY:

The word augmented is derived from a Latin word meaning “to add’’. Essentially, AR enhances the experience of the real world by adding elements to the existing world. Bob Sproull first invented the first VR and AR head-mounted display system. After several developments in improving the experience, the term AR was coined in 1990 by Thomas caudell and David Mizell.

Augmented Reality (AR) is the integration of digital information with the user’s environment in real-time. Unlike virtual reality (VR), which creates a totally artificially environment, AR users experience a real-world environment with generated perceptual information overlaid on top of it. Augmented Reality is a technology which superimposes newline computer-generate virtual content on the physical objects in the new line computer-generated real scene.

Augmented Reality uses the physical environment around it and overlays the animation or any form of information on it. Technically, it adds more to the reality. One of the biggest benefits of Augmented Reality application development is that it doesn't need any dedicated device for display. Due to these benefits, the technology becomes mainstream of the fourth industrial revolution.

Definitions of AR:

The definitions of AR given by different educationists and perspective as given below;

1. Augmented reality (AR) is the real-time use of information in the form of text, graphics, audio and other virtual enhancements integrated with real-world objects.
2. Augmented reality is a type of technology that allows digital images and information to be displayed on to the physical environment.
3. Augmented reality is a new and evolving technology that lets its user experience a world added with digital content like visual images, graphics, and other information.

1.2 AUGMENTED REALITY PEDAGOGIC APPROACH (ARPA):

It is new desired pedagogical approach used for elementary scence teaching using AR technology. Im otherwords, It is flat form wherein AR is used by making use of our smart phones or tablets.

1.3 NEED AND SIGNIFICANCE OF THE STUDY:

'A picture is worth a thousand words.' Augmented Reality helps you in achieving this. Rather than reading a chapter, it will be more effective to visualize the subject. It helps students get a better understanding and insights about the topic. Also, offering interactive experiences, the Augmented Reality keeps students excited and interested in new learning.

One of the most significant benefits of Augmented Reality in Learning and Development is that it does not require any investment regarding hardware. We can experience Augmented Reality using our smart phones or tablets. For example, Augmented Reality application development allows placing the smart phone camera in front of a textbook and seeing a 2D image turning into a 3D animation.

Today, it might not be present in every school or college, but in the upcoming years it will be there. According to New Jersey Institute of Technology reports, the Augmented Reality app development market is rapidly growing. We all will witness this revolution in upcoming days.

Hence it is evident that, there is urgent need to create user-friendly, flexible, educational principle incorporated and academic inputs integrated ARPA for elementary science teaching-learning.

By keeping above contexts, researcher will plan to undertake the study Development and Validation of Augmented Reality Pedagogic Approach (ARPA) for School Science.

1.4 STATEMENT OF THE PROBLEM:

The Researcher will undertake the study **"Development and Validation of Augmented Reality Pedagogic Approach (ARPA) for School Science at Elementary Level".**

1.5 OBJECTIVES OF THE STUDY:

The following objectives are framed for the present study;

1. To develop Augmented Reality Pedagogic Approach (ARPA) for school science at elementary level.
2. To validate the Augmented Reality Pedagogic Approach (ARPA) against school teachers in terms of planning and teaching effectiveness.
3. To find out the effectiveness of Augmented Reality Pedagogic Approach (ARPA) in terms of its user friendliness, flexibility and acceptance by school teachers.
4. To find out the effectiveness Augmented Reality Pedagogic Approach (ARPA) in terms of its user friendliness, flexibility and acceptance by school students.

1.6 HYPOTHESES OF THE STUDY:

The following research hypotheses are framed for the present study;

1. The Augmented Reality Pedagogic Approach (ARPA) is effective in terms of planning and teaching effectiveness.
2. The classroom teaching with the Augmented Reality Pedagogic Approach (ARPA) is more effective than those assisted with traditional teaching.
3. The Augmented Reality Pedagogic Approach (ARPA) is effective in terms of its user friendliness, flexibility and acceptance by school teachers.
4. The Augmented Reality Pedagogic Approach (ARPA) is effective in terms of its user friendliness, flexibility and acceptance by school students.

1.7 OPERATIONAL DEFINITION OF TERMS USED:

1) **Pedagogy**: it is a art and science of teaching.
2) **Augmented Reality (AR)**: It is the integration of digital information with the user's environment in real-time.

3) **Augmented Reality Pedagogic Approach (ARPA):** It is the pedagogical approach used for elementary science teaching using AR technology.
4) **Validation:** Validation is the process of ensuring that, the developed material satisfies the objectives pre-decided for the approach. In other words, it is the process to find out the extent of serving the purpose for which it has been developed**.**

1.8 VARIABLES OF THE STUDY:

The following variables were considered for the present study;

1. **Independent Variables:** ARPA
2. **Dependent Variables:** Teaching effectiveness
3. **Co-variables:** Mobile handling skills, Science content Mastery, IQ, and type of school.

1.9 DELIMITATIONS OF THE STUDY:

In order to make the study concise, its scope pertaining to some of the aspects will be planned to limit to some extent. This study will be conducted in ICT-pro primary and higher primary schools of of north Karnataka.

2. REVIEW OF RELATED LITERATURE:

2.1. Reviews related to AR in Education:

H.R. Bhutak (2004) Conducted study on Development and effectiveness of Multimedia Package for Science Subject of Standard 9. The results indicated that, Multimedia package was more effective in terms of achievement and retention of science for both the groups of girls and the boys separately and jointly.

1. **Augmented Reality in Education:** How to apply it to your Ed Tech Buiness (12/4/2023)

Augmented reality is a new technology and education buzzword. It satisfies the students' desires to learn new things and to think more critically about the world. Teachers and students may cooperate, explore, and learn together in a virtual 3D environment thanks to this fantastic leveller. When students use AR to build experiences that show they understand a particular idea or criterion, their engagement rises. Students are more willing to explore the lesson or activity using critical thinking, problem-solving, and communication abilities. Students can use the cube in conjunction with object viewer apps to view fossils and learn about the water cycle.

2. **Neha Tuli (2020),** AR learning environments for early childhood (2020)

Objectives:

1. To locate the literature that already exists on the usability guidelines for AR applications.
2. To provide usability guidelines for AR programmes aimed towards kindergarteners.
3. Create the ARLE in accordance with the cited usability standards.

Methodology:

This article offered 23 usability principles. It uses a combination of approaches to assess the usability of the proposed ARLE and a quantitative method to assess its efficacy and efficiency. The SUS questionnaire is the basis for this quantitative method. Interviewing users for feedback in a qualitative way.

Findings:

This study demonstrates how much the young users of the created ARLE. It is a highly helpful teaching tool that can be utilised in conjunction with conventional instruction and because it piqued students' interest. This study also indicated that using technology for purposes other than entertainment is a successful strategy.

2.2. Reviews related to Software development and its validation:

Prabhakar, S., (1995), conducted study on Development of Software for Computer Aided Instruction and its Comparison with Traditional Method for Teaching Physics at Plus II level. The present study was experimental and pre-test-post-test control group design was used. The results indicated that, The CAI material was found to be effective in terms of achievement and reaction towards CAI material of both class XI and XII students. The CAI was found to be significantly superior to traditional method in terms of achievement of class XII students when moderate variables were considered as covariates separately.

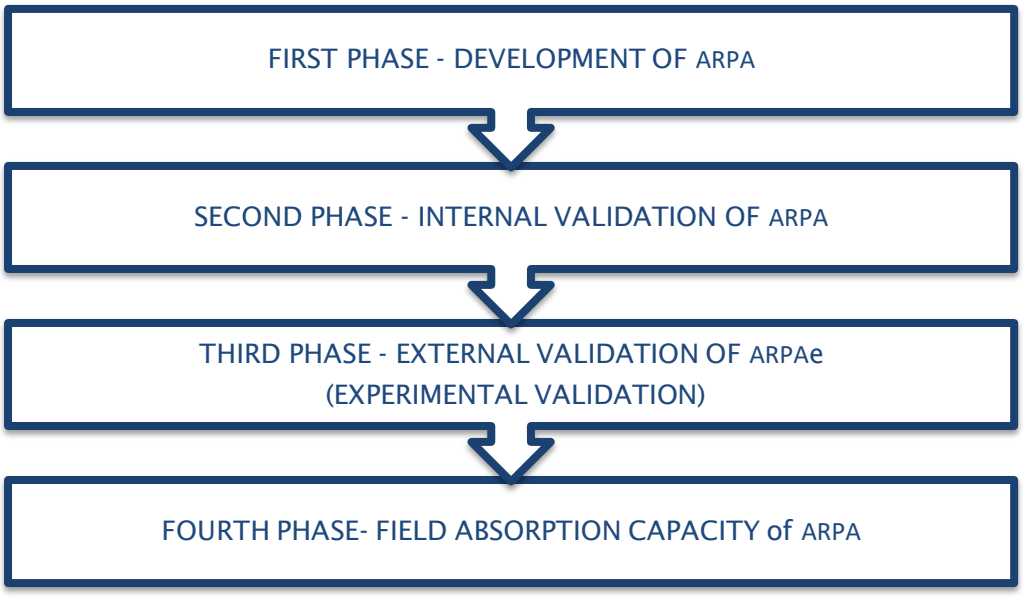
Mark Notess. (2008), Applying Contextual Design to Educational Software Development: Indiana University, USA,. Contextual Design is a methodology for developing information systems from a rich understanding of customer work practice. This chapter considers how Contextual Design can be applied to educational software development and how Contextual Design might interact with Instructional Systems Design (ISD). Following a brief overview of ISD, He describe Contextual Design and provide a detailed case study of its application to educational software development — to the design of an online tool for music listening and analysis in undergraduate and graduate music education.

Dily (2008), Conducted a study entitled as "The effect of using Mathematics software produced locally on second grade intermediate female students' academic achievement in Riyadh." The study sample consisted of 70 female students divided equally in two experimental and control group which were taught by the locally produced software and traditional method. The study revealed no statistical significant difference between experimental and control group at 0.05 level of significance.

Prakash Badiger (2017), has undertaken study entitled **"**Development and Validation of Computer Aided Lesson Planning (CALP) software for Teaching Practice". Researcher has discussed 4 phases of research design. In the first phase development of CALP software, second phase internal validation of the CALP software, third phase external validation of CALP software and fourth phase field absorption capacity of CALP software. For data analysis computer aided lesson planning is more effective than traditional planning in terms of t-test and percentage analysis techniques were used. The findings of the study are, the teaching effectiveness. The CALP software is effective in terms of its user friendliness, flexibility and Acceptance by in-service teachers.

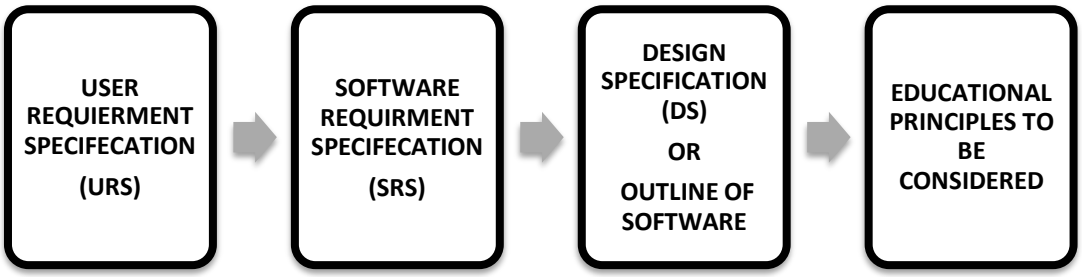
3. RESEARCH METHODOLOGY:

The New Product Development (NPD) research methodology will be adopted by the researcher for the development and validation of Augmented Reality Pedagogic Approach (ARPA) for elementary school science. Hence for the present study investigator is decided to follow experimental method of research**.** This Approach development and validation process will be as follows;


FIRST PHASE - DEVELOPMENT OF ARPA
SECOND PHASE - INTERNAL VALIDATION OF ARPA
THIRD PHASE - EXTERNAL VALIDATION OF ARPAe
(EXPERIMENTAL VALIDATION)
FOURTH PHASE- FIELD ABSORPTION CAPACITY of ARPA

PHASE -1: DEVELOPMENT OF MRM-PROGRAMME

During the first phase, the researcher planned to develop the ARPA. Here she planned to design the ARPA and its development. The designing process involves the following sequential steps;


USER REQUIERMENT SPECIFECATION (URS)
SOFTWARE REQUIRMENT SPECIFECATION (SRS)
DESIGN SPECIFICATION (DS) OR OUTLINE OF SOFTWARE
EDUCATIONAL PRINCIPLES TO BE CONSIDERED

PHASE -2: INTERNAL VALIDATION OF ARPA:

During the second phase, the researcher planned for the internal validation of ARPA. This will be done against educational experts, educators, in-service teachers, student-teachers and students so as to find out the errors and required necessities in modifying the ARPA.

PHASE -3: EXTERNAL VALIDATION OF ARPA:

During third Phase, the researcher planned for External validation of ARPA. External validity is designed with the four steps as follows;

(i) Selection and development of tools for co-variable measurement:

Following co-variable tools will be used in the study;

1. Multiple Intelligence (M.I) Test - (Howard Gardeners')
2. Achievement Motive Test (ACMT) - (V.P. Bhargava)
3. Mobile Aptitude Test - (Self developed)

(ii) Tools development for dependent-variable measurement:

The following dependent-variable tools will be used in the study;

1. Baroda General Teaching Competency Scale (BGTCS)
2. Teacher reaction scale (Self developed)
3. Student reaction scale (Self developed)

(iii) Development of experimental design:

For experimentation parallel group design will be adopted for the smooth conduct of experiment.

(iv) Experimental treatment:

The experiment will be conducted in elementary schools.

Population for experiment:

ICT-pro Teacher and school are the essentiality to validate the package.

Sample:

The study is designed with the purposive sampling based validation. Among the interested list of teachers with their students were the samples for the study. Total 10 schools were selected in north-Karnataka region.

The schematic designs of the experiment are given in the proceeding flowchart.

Experimental group	Control group
Pretest- (Achievement in science)	**Pretest-** (Achievement in science)
Treatment- (Teaching through Augmented Reality Pedagogic Approach (ARPA) developed by Investigator)	**Treatment-** (Teaching through convention method)
posttest- (Achievement in science)	**Posttest-** (Achievement in science)

PHASE -4: FIELD ABSORPTION CAPACITY OF ARPA

During fourth Phase, researcher will conduct field absorption capacity of the ARPA with teachers, students for its effectiveness. For this purpose, the researcher will plan to administer two tools prepared namely Teacher reaction scale and Student reaction scale for the effectiveness of approach developed.

4. PROCEDURE FOR DATA ANALYSIS:

The data obtained on various tools will be treated quantitatively. Basically computation of mean testing and testing the hypothesis will be the t-test; ANOVA will be used for various variables. Percentage analysis and graphical representation will use with all other types data.

5. EXPECTED OUTCOMES:

The study will provide a well tried out ARPA to be used for effective classroom teaching at Elementary science by the teachers. Study will also be helpful to the students for joyful learning.

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